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ABSTRACT

This document discusses methodological issues involved in tracking panel respondents. (Panel studies are described as a type of longitudinal study which requres gathering data from the same individuals at more than one point in time.) First, an overview is presented of representative studies which follow different tracking methodologies that have contributed to the current state-of-the-art in tracking procedures. On the basis of these and related studies, suggested criteria are made for assessing the feasibility of conducted follow-up studies and the degree of difficulty that may be anticipated in tracking former respondents. Next, procedures are outlined that were followed in the panel study conducted for the Career Development Study, a current effort at relocating over 6,800 former high school students after a 12-to-13-year interval (see CE 022 277 for details of this study). Finally, detailed documentation is presented of the response rates and expenditures associated with these procedures. (BM)

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ALTERNATIVE TRACKING METHODS IN PANEL STUDIES: THEIR COSTS AND RELOCATION RATES*

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ALTERNATIVE TRACKING METHODS IN PANEL DESIGNS: THEIR COSTS AND RELOCATION RATES*

Introduction

Ten years ago Eckland (1968:54) observed that researchers contemplating panel designs had little technical information to consult other than their own experience and the personally communicated do's and don'ts of some of their colleagues. Over the past decade, however, a number of articles and manuals have appeared outlining the experiences of researchers who, successfully or otherwise, have engaged in large-scale panel studies (e.g., Clarridge, Sheehy and Hauser, 1976, 1978; Temme, 1975; and Carrel, Potts and Campbell, 1975). In addition, there is record of one modest attempt to test the effectiveness of alternative tracking techniques within the framework of a larger study (Willits, Crider and Bealer, 1969). Unfortunately, the results of these efforts continue to be largely non-cumulative and the materials are often inaccessible. The present paper is an effort to begin to accumulate, integrate, and summarize the procedures, results, and costs

*I gratefully acknowledge the major contributions of my project associates in the design and execution of the research upon which this paper is based. Vaughn R.A. Call assumed major responsibilities throughout the tracking effort. His efforts were bolstered by Kenneth I. Spenner, Sandra Wendel and Keith Vandergrift. David A. Chapin provided technical assistance in creating computer software.

incurred in some of the more significant tracking efforts that have been attempted thus far.

Relative to other research designs, panel designs have received only moderate use. Clearly, a lack of established procedures is one reason. Kodlin and Thompson (1958:23), for example, noted the shortcomings as follows:

> ...there is considerable disparity between the soundness of ideas which underlie the longitudinal approach and the methods by which this approach is carried out. It is this disparity, in some instances obvious to all, that gives rise to uncertainty regarding the value of longitudinal studies.... The shortcomings exist because there is considerable disparity between our conceptualization of how problems should be solved and the adequacy of methods and tools we can employ to solve them.

There are other considerations. A second is the apparent change in public receptivity to surveys in recent years which from a researcher's perspective translates into declining response rates and sample attrition in panel designs.[1] This consideration underscores the need to differentiate between different kinds of nonresponse to surveys, some of which may result from the respondent's inability to respond (an issue of "coverage") and others of which may result from the respondents' refusal to cooperate (an issue of "response").[2] The subject of tracking or relocation success bears largely upon the issue of noncoverage. To the extent that nonresponse rates are the result of failure to maintain contact with or failure to relocate panel

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1. Sample attrition threatens the reliability of study results and the validity of the inferences that are made.

2. We define coverage as the proportion of the total sample elements contacted (Alwin, 1977). Noncoverage, then, may be defined as the sample elements which were not located and, therefore, could not be studied. The rate of coverage may be calculated as the coverage (total number of sample

respondents, attrition in panel designs is a function of tracking inefficiencies. To the extent that relocation procedures can be improved, the problem of nonresponse due to noncoverage may be alleviated.

There is a third consideration. It is the economic argument. Substantial costs may be incurred in maintaining or renewing contact with study participants 5, 10, 12, 15 and more years after the respondents were first studied. Relocating respondents requires resources. The economics of panel research must be weighed on a scale which seeks to balance fiscal costs with knowledge gained about social development and change over time. We will demonstrate that while the follow-up costs of panel designs cannot be eliminated, the expenses may be greatly reduced through careful planning and effective execution. There may be other reasons that researchers avoid panel designs including some career implications of conducting long term studies and the policy makers demands for more immediate results; but the perceived difficulties in funding and executing a successful tracking effort are undoubtedly the major considerations.

This paper discusses methodological issues involved in tracking panel respondents. We provide an overview of representative studies which follow different tracking methodologies that have contributed to the current

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elements minus the noncovered cases) divided by the total sample size. Proceeding with the distinctions, response refers to the sample elements studied from among those covered and nonresponse refers to the sample elements not studied (either because the respondents were unable to participate or refused to participate). The response rate may be calculated by dividing the number of sample elements studied by the number of sample elements covered. Finally, the completion rate consists of the number of sample elements studied divided by the total sample size (the product of the coverage and response rates). These distinctions have been discussed in greater detail by Alwin, Finney, and Otto (1978).

state-of-the-art in tracking procedures. On the basis of these and related studies we suggest criteria for assessing the feasibility of conducting follow-up studies and the degree of difficulty that may be anticipated in tracking former respondents. We outline in detail the procedures that my colleagues and I have followed in The Career Development Study, a current effort at relocating 6,805 former high school students after a 12/13-year interval. Finally, we present detailed documentation of our response rates and the expenditures associated with our procedures.

Before proceeding we note that the title of this paper makes reference to panel studies, not longitudinal studies. There are numerous variants of longitudinal studies which evolve from three major types of research designs: panel, trend, and cohort studies. Panel studies, the subject of this paper, require gathering data from the same individuals at more than one point in time. Trend studies describe changes in a population utilizing two or more cross-sectional samples over time. Cohort studies are a special case of trend studies. Two or more cross-sectional samples of a group or cohort are drawn at two or more points in time. The distinguishing characteristic of the panel study is that it requires data gathered from the same individuals over time. This paper focuses on the limited case of panel studies wherein the challenge is to relocate and extract valid and reliable information from the same individuals over time. We do not address the problem of maintaining contact with respondents except as these efforts ease problems associated with tracking. We give particular attention to long-term (studies with an interval of 5 years or longer) and large-scale (studies with samples of 5000 or more respondents) tracking efforts which precede gathering data by survey procedures.

I. AN OVERVIEW OF SELECTED FOLLOW-UP STUDIES

This discussion is informed by the experiences of others. There have been literally hundreds of panel studies reported in the literature. Most were conducted by educators, psychologists and guidance counselors working with short-term and small-sized samples or populations. Thus, for example, Perrone (1973) annually studied the educational and occupational plans of 96 parent-daughter pairs and 74 parent-son pairs who did not leave the school district from grades 7 through 12. There have also been a few reports--not more than 25--which are instructive concerning tracking long-term and large-scale panels. In this section we present an overview of seven follow-up efforts of widely diverse samples which were selected to illustrate representative tracking strategies that have been employed together with relocation rates and cost estimates where such information is available.

The reader is forewarned concerning five characteristics of this literature. First, the reports are of uneven quality with respect to completeness and attention to detail. Typically, discussion of the tracking process has been abbreviated and presented as background to a substantive treatise. Second, different reports of the same tracking effort are sometimes inconsistent with respect to the procedures followed, the numbers of respondents who originally participated, and the relocation rates produced. Where such ambiguities occur we have relied primarily upon the most recent published reports of the tracking effort.[3] Third, given the lack of

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3. We neither identify, discuss, or attempt to resolve inconsistent reports in this paper.

conceptualization in the tracking literature, the reader may occasionally experience some difficulty in making comparisons across studies. Thus, for example, not all studies differentiate between relocation rates (an issue of tracking success) and response rates (an issue of respondent participation in the survey). We offer some clarifications where confusion might otherwise result. Fourth, caution must be exercised in comparing cost estimates where available inasmuch as studies may vary considerably with respect to the bases for estimating expenses. In addition, adjustments have to be made for the effect of inflation over time. Finally, relocation rates are typically reported without information on whether verification was made.

The following representative studies were selected for review because they differ, first with respect to the geographical dispersion of the target samples, second with respect to the tracking procedures employed, and third with respect to the relocation rates reported. We present a brief statement of each study giving attention to the follow-up information on respondents available to the trackers, the relocation procedure(s) employed, the relocation rates reported, and the cost estimates, if reported.

The Baltimore Chronic Illness Follow-up

The Baltimore follow-up (Bright, 1967) consisted of a very successful, multi-method strategy for relocating a city household sample. The original survey was conducted in 1953 and 1954 with the follow-up beginning in 1960 and completing two years later. The purpose of the follow-up was to

conduct a mortality analysis. The original household sample consisted of 11,324 persons aged 0 - 70.

Although specific details are not given concerning the type and amount of identifying information on respondents available to the trackers, it appears that only the respondent's full name and household address, possibly supplemented by some initial survey information, was available.

The tracking procedures used were these:

1. Telephone calls were placed to respondents with listings.
2. Individually prepared letters were sent to those not reached by telephone for whom provisional addresses had been obtained through telephone and city directories.
3. For those reached neither by telephone nor letter, contacts were made with relatives, friends, present or past neighbors, physicians, public health offices, nursing homes, schools, employers, morticians, unions, and a great variety of other city, state, and federal governmental and voluntary agencies.

These methods were pursued for 16 months with a staff of two full-time and two part-time persons. Thereafter, an additional 8 months of intensive work with a new tracking staff was devoted to relocating the remaining "hard-core" following this procedure:

4. Tracers were sent to neighborhoods were individuals were known to have resided seeking leads from neighbors, storekeepers, bartenders, and the like. All tracing possibilities were exhausted.

Procedures 1 - 3 resulted in successful relocation of 77.3 percent of the original respondents. Implementation of the intensive tracking techniques increased the overall relocation rate to 96.1 percent. The following summary relocation rates were reported for general procedure cattegories by race:

Procedure	Percent Whites Located	Percent Non-Whites Located
Telephone	56.2	38.2
Letter	7.7	7.8
Home visits	26.5	42.9
Death Records	6.6	5.1

The researchers conclude that it is possible to trace most persons in a general population sample within 6-7 years of the initial contact. Information on costs is not provided.

The Adolescent Society Follow-Up

Temme's (1975) Adolescent Society Follow-Up is noteworthy because of the computerized efficiencies and multi-method tracking strategies it employed in relocating students in schools located within 100 miles of Chicago. Coleman's (1967) research chronicle reveals an original 1957 sample of 9,783 persons, that a subsample of seniors (N=1,030) responded to a questionnaire in the fall of 1958, and that a subsample of seniors (N=996) also responded in the spring of 1961. The 15-year follow-up (1972-75) sought to relocate a subsample of the original respondents, N=9,033.[4]

Limited information was available to inform the tracking effort: respondent's name and address for 1957, parents' name and address for 1957, ten-year class reunion lists from 23 of 39 classes involved in the original study, identification of respondent's friends, and information from the original study and two subsequent sub-studies. The following procedures with estimated relocation percentages were employed:

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4. One high school serving recent immigrants was excluded from the follow-up effort.

Procedure	Percent Located
1. Creation of computer file of 1957 names and addresses	-
2. Telephone directory search	
3. March/Summer 1972: as many as three mailings with postcard and one telephone contact with parents at 1957 address or new address based on telephone search	46.9
4. Fall 1972: class reunion lists searched; letter sent to confirm addresses	
5. Fall 1972: community canvasing by local (volunteer and paid) resource people	18.7 (verified)
6. Fall 1972: sociometric mailing (to friends identified on data file)	9.9 (unverified)
7. March 1973: questionnaire mailing which included list of unlocated classmates and requests for information on their whereabouts	4.8
8. Miscellaneous	5.3

By the summer of 1973 the overall relocation rate reported was 87.5 percent. However, only 46.5 percent of the 9033 former students had responded to the survey. At that time the project was shut down for financial reasons.

In May 1974 Temme moved to another institution and the project was revived. Resumption of the tracking effort followed these procedures:

Procedures[5]

1. Effort resumed with computerized file of all located and non-located respondents, the latter N = 4831
2. Summer 1974: search for addresses and telephone numbers with the assistance of relatives, employers, friends, and telephone directories

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5. Percentages located by procedures in the resumed tracking effort are not reported.

3. Summer 1974: telephone call to telephone numbers obtained
4. Summer 1974: letters sent to addresses obtained
5. Summer 1974: news releases to newspaper and radio stations
6. Newspaper ads listing 1,803 unlocated names published in community newspapers[6]
7. Telephone contact attempted

By July 1975 7,096 (78.6 percent) respondents were located in the combined tracking efforts. (The discrepancy between the Summer 1973 and July 1975 reported relocation rate was reported due to the fact that some people moved in the interim and were not relocated and that not all addresses were verified in 1973.) Cost estimates are not provided.

The Rural Pennsylvania Study

The Rural Pennsylvania Study (Willits, Crider, and Bealer, 1969) is noteworthy because it incorporates an experiment for analyzing the effectiveness of a number of procedures for relocating respondents in a state study. A total of 2,810 persons were initially contacted in 1947 when they were sophomores in rural Pennsylvania high schools. Intermittent contact (unspecified) was maintained with the original respondents over the next ten years and, in 1957, of the original cohort, 2,344 respondents (83 percent) were relocated and interviewed.

In 1966 the project was reactivated. Using mail contacts and visits to the high school communities, current addresses were obtained for all but 108 (4.6 percent) of the 2,344 respondents who participated in the 1957 survey. A modest attempt to evaluate the relative effectiveness of various tracking

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6. Four hundred and nineteen interviews resulted.

procedures consisted in the random selection of 320 respondents who were used in each of four experimental conditions: mail contact, telephone contact, community visit, and public record searches. The information available to assist the tracking effort consisted of the respondent's name, 1947 post office designation, 1957 married name and address (age 26-28), parent's or guardian's name and 1947 address, and the name and address of the high school attended in 1947.

The 1967 tracking procedures for the four experimental conditions and their relative success were reported as follows:

Procedure	Percent Located
Mail Contact Condition	
1. January 1967: first class letter mailed to 1957 address with postcard enclosure.	
2. February 1967: second mailing	48 32 (letter undelivered) 20 (letter delivered but no response)
Telephone Contact Condition	
1. Telephone numbers were obtained through area telephone information operators using respondent's name, parents' names, and names of extended family.	
2. Telephone calls placed to 1947 communities	85
3. Telephone call placed to 1957 communities (if different)	80
Community Visit Condition[7]	
1. Visit to 1947 post office	46
2. Visit to 1957 post office	24
3. Visit to 1947 school	73
4. Visit to 1957 employer	60
5. Visit to 1947 residential neighborhood	82
6. Visit to 1957 residential neighborhood	59

7. In each condition the attempt was to find the same 320 respondents by alternate methods. The only exception was for community visits where only

Public Record Search Condition[8]

1.	1947 marriage license search	19
2.	1957 marriage license search	22
3.	1947 real estate transfer search	10
4.	1957 real estate transfer search	9
5.	1947 registration of wills search	6
6.	1957 registration of wills search	6

Among their conclusions Willets and colleagues (1969: 72-74) note that the tracking procedures initiated through the resident's 1947 community were more effective in locating subjects than were procedures through the resident's 1957 community suggesting that identification of the parental family is more easily accomplished than that of locating single individuals or newly established families of procreation. The researchers argue for employing multiple tracking procedures. They provide no cost estimates.

The Wisconsin Follow-Up

One of the most successful recent large scale tracking efforts was accomplished by William H. Sewell and Robert M. Hauser in their 1974 seventeen-year follow-up of Wisconsin high school students (see Clarridge, Sheehy, and Hauser, 1976). The search consisted of an effort to relocate a subsample of 10,317 subjects who were first studied and graduated from high school in 1957.

The distinguishing characteristic of the Wisconsin search procedure is that it relied primarily upon use of the telephone to relocate a state sample.

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the 157 who were not located by telephone were tracked. It was assumed that if they could be located by telephone they could also be located by a personal visit.

8. In the public record search an attempt was made to find the 320 individuals by each procedure and in both the 1947 and 1957 community of residence (if different).

Since the researchers wished to avoid direct contact with the respondents before the survey interview and to minimize the opportunity for refusal to participate, respondents were traced through their parents wherever possible. An earlier re-study of the respondents seven years after the initial study (1964) had located 87.3 percent of the original respondents, and the trackers had access to some basic identifying information that was no more than ten years old: respondent's name and address in 1964, respondent's parents name and address in 1964, respondent's high school name, and the 1957 and 1964 survey information.

The following procedures were employed, in the order of their use, together with the reported relocation rates by procedure:

Procedure	Percent Located
1. Telephone book search for parents[9]	82.3
2. Telephone book search for respondents	9.8
3. Occupation leads	1.4
4. College Alumni office leads	2.2
5. City directory search for neighbors	1.4
6. High schools	-
7. Post Offices	.3
8. Military locator services	.3
9. Letters to other respondents	.8
10. Letters to individuals without phones	-

The 1974 tracking efforts successfully relocated 97.4 percent of the original target respondents establishing a new criterion by which to assess the adequacy of large scale tracking efforts. Clarridge and colleagues (1976) attribute their success to extensive use of the telephone, to the organization and management of the search procedure, and to the availability of several diverse types of identifying items which could lead to the location of respondents. No cost estimates are reported.

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9. The telephone search for parents revealed potential leads on 98 percent of all parents or respondents in the study.

The National Longitudinal Surveys

The National Longitudinal Surveys collected by the U.S. Census Bureau (data collected for the Department of Labor and analyzed by the Center for Human Resource Research at Ohio State University) have addressed the problems of determining how to retain as many persons as possible in the survey sample over a period of years and establishing the most effective means of relocating respondents for follow-up interviews (Fondelier, 1976). Four population groups are represented by survey samples: Mature Men's Survey of respondents who were 49-59 years old in 1966 (N = 5225); Mature Women's Survey of respondents who were 30-44 years old in 1967 (N = 5159); Young Men's Survey of respondents who were 14-24 years old in 1966 (N = 5034); and Young Women's Survey of respondents who were 14-24 years old in 1968 (N = 5083). The respondents represent a national civilian probability sample of specific age cohorts in the period 1966-68. Follow-up surveys were conducted at one or two year intervals over a ten year period and careful records were kept of the methods used to relocate respondents in each sample over time.

The U.S. Census provided interviewers with as much tracking information as possible: name and address of each respondent; respondent's telephone number; all addresses at which the respondent had lived over the period of the study; the names of all persons who had lived with the respondent since the study began; names and addresses of present and past employers since the study began; the name of college attended, if any; the names of household residents; and the names, addresses, and telephone numbers of two persons who will always know where the respondent can be reached. Interviewers were also authorized to contact other sources for locating

respondents including the post office, local businesses, the telephone company, and persons living in the area. In order to reduce the considerable amount of available data on the tracking methods used in the four surveys, each of which had been done for several years, one year from each survey was selected to closely examine the methods employed and their relative effectiveness. The survey years selected were the 1970 Young Women's Survey, the 1970 Young Men's Survey, the 1969 Mature Women's Survey, and the 1971 Mature Men's Survey. The following procedures were followed:

Procedure

1. If the time lapse since the prior interview was two years, the Postal Service was asked to verify and correct the respondent's addresses a few months before interviewing began.

2. Interviewer went to address.

3. If direct contact with the respondent was not accomplished, interviewers were instructed to use the most convenient of the following methods for acquiring additional information concerning the respondent's whereabouts:

    a. contact current residents of the house
    b. contact landlord or manager
    c. contact neighbors
    d. contact persons listed as knowing where the respondent would be
    e. contact schools
    f. contact post office
    g. search voting records
    h. search telephone directory or seek operator directory assistance

4. Interviewer recorded the method used to locate the respondent.

Two limitations must be observed in comparing the relative success of the methods employed. First, the various methods were not utilized in any particular order. Second, the methods were not used equally--i.e., not every method was used to locate every respondent who could not be located.

Indeed, one method was used as little as 1.3 percent of the time (contacting the school in the Mature Men Survey) whereas another method was used as much as 28.7 percent of the time (contacting persons listed as knowing where the respondent would be in the case of the Young Men's Survey). Nonetheless, the comparative successful location rates by method are instructive:

Procedure	Percent Located of 1970 Young Women	Percent Located of 1970 Young Men	Percent Located of 1969 Mature Women	Percent Located of 1971 Mature Men
1. Persons listed as "knowing"	65	77	68	59
2. Telephone company	76	81	77	74
3. Parents	99	87	-	-
4. Neighbors	18	25	33	31
5. Occupants	11	26	26	26
6. Apartment Managers	7	12	33	19
7. Post Office	28	39	61	40
8. School	5	43	21	0
9. Persons living at residence	97	94	-	-
10. Telephone number	97	100	77	80
11. Siblings	-	83	-	-
12. Employer	74	73	50	63
13. Family member (in sample)	100	-	100	-
14. Miscellaneous	78	69	83	63
15. Wife or ex-wife	-	92	-	-
16. Relatives	-	90	100	67
17. Husband's employer	-	-	80	-
Number of contacts	3000	1737	944	611
Overall success rate/ contact	39.3	54.5	50	42

The ten year relocation rates (counting deaths as "located") were:

Sample	Percent Located
Mature Men (age 45-59)	89.7
Young Men (age 14-24)	79.9
Mature Women (age 30-44)	84.9
Young Men (age 14-24)	87.3

Fondelier (1976:11) concludes that "with enough information from previous interviews and other sources...longitudinal survey interviews should be

able to locate all but a very few of their respondents." Cost estimates are not provided.

Project Talent

The most ambitious follow-up effort ever attempted is that of Project Talent, a comprehensive 18-year effort (to date) to investigate the personal, educational, and experiential factors that promote or inhibit the development of human talents (cf. Rossi, Wise, Williams, and Carrel, 1976; Wise, McLaughlin, and Steel, 1977; Carrel, Potts, and Campbell, 1975; Flanagan, 1964). Talent is based on an original probability sample representative of all U.S. high school students in grades 9-12 in 1960 (N = 375,122). The initial saturation sample was augmented by various special interest samples such that the original sample size totalled about 400,000. Periodic follow-up surveys occurred 1, 5 and 11 years following the expected year of graduation from high school. The present discussion is limited to the 11-year general follow-up of 1971.

An attempt was made to relocate the original Project Talent sample (N = 375,122 plus special interest samples). The available information on respondents included: respondent's full name, address, birth date, school attended, father's complete name, and mother's maiden surname. In addition, efforts at address maintenance had proceeded over the years consisting of an annual mailing of a newsletter including requests for changes of address and update address information provided by the postal service. For each 1960 grade--i.e., 9th, 10th, 11th and 12th--the following procedures were observed:

1. Project newsletter was mailed
2. First wave questionnaire mailed
3. Reminder postcard mailed
4. Second wave questionnaire mailed
5. Third wave questionnaire mailed
6. Fourth wave questionnaire mailed

For most mailings third class mail was used. However, first class is indicated for the reminder post card to the 12th grade, the third wave questionnaire mailing to the 11th grade, the first wave mailing to the 10th grade, and the first wave mailing to the 9th grade. Questionnaire mailings included a cover letter and postage-paid return envelope. Address correction requested was stamped on all mail-outs except those waves marked first class.[10] The response rates for the 11-year follow-up are as follows:

	Percent Response to Mail Survey
Grade 12	27.9
Grade 11	24.8
Grade 10	19.9
Grade 9	19.6

Project Talent attempted to compensate for the attrition (due to the ineffectiveness of its single method mail tracing procedures) by developing an elaborate weighting scheme for the respondent data. In order to inform the weighting scheme an intensive effort was made to relocate a sub-sample

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10. The effect of third class address correction requests is that the postal service forwards the new address to the sender while discarding the content of the original mailing without forwarding it if the new address is outside the city to which the questionnaire was sent.

of the original nonrespondents. The subsample ratios and sizes by grades were as follows:

Grade	Sampling Ratio	N
12	1:24	2529
11	1:28	2557
10	1:32	2551
9[11]	1:21[12]	4029

Multi-method procedures were generally followed by the in-house staff for relocating the sub-samples of the original non-respondents. (Note that the mailing tracking strategy had already been attempted for the sub-sample respondents.) The following procedures were used:

1. A search was conducted of the information sheets on file for each respondent.
2. Telephone directories were checked.
3. Telephone information operators were contacted.
4. Contacts were made with schools.
5. Marriage records and Department of Motor Vehicle records were searched.

Differential reliance was placed on in-house telephone trackers, regional tracking coordinators, and the Retail Credit Bureau (now known as Equifax) by grades. Thus, for example, the 11th and 12th grade follow-ups relied heavily upon the regional coordinators and the Retail Credit Bureau. However, as the effort progressed it was concluded that the tracking could be most effectively managed through a central operation conducted by in-house staff and most of the tracking for the 9th and 10th grade follow-ups was

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11. Grade 9 was stratified by academic aptitude and was oversampled on ethnic minorities.

12. The sampling ratio we report for Grade 9 is an average computed across strata.

conducted by the in-house staff. The multi-method sub-sample tracking effort produced the following relocation rates and cost estimates:

Grade	Number of Cases Located	Percent Relocated	Interviewing and Relocation Costs
Grade 12	1898	75	n.a.
Grade 11	2386	93	$35.65/person located
Grade 10	2303	90	$34.47/person located
Grade 9	3485	89	$50.00/person located

The fact that much higher relocation rates were achieved for the sub-samples (persons who were unlocatable by the main tracking effort) than for the main effort itself illustrates the increased effectiveness of multiple method tracking procedures coupled with persistence.

Overall the various techniques resulted in the following number of students surveyed in the 11th year follow-up study:

Grade	Original N	Total Percent	Total N Responding
12	81,175	30	24,150
11	92,503	27	25,046
10	99,849	22	21,862
9	101,777	23	23,046

Given these outcomes less than 30 percent of the cases in any of the four grades can have data available on each of the three follow-up studies (1 year, 5 year and 11 year follow-ups).

The National Longitudinal Study of the High School Class of 1972

In the spring of 1972 a study design was implemented by Educational Testing Service, contractor for the National Center for Educational Statistics, for a national probability sample of over 21,000 seniors in 1,200 high schools (Fetters, 1974). The sample of schools was chosen from a universe that was stratified by seven main variables: public/nonpublic, region, enrollment,

proximity to college, percent minority enrollment, income level of community, and degree of urbanization. On the basis of these variables a total of 600 strata were identified, two schools (and two backup schools) were randomly selected from each strata, and a random sample of approximately 18 seniors--fewer in the case of very small schools--were selected from each school. Of the schools contacted, 1,044 (87 percent of the target number of 1200) agreed to participate in the study as did an average of 17 students per participating school. The resulting sample size was 17,726 students. In the summer of 1973 the National Center for Educational Statistics contacted the schools that initially did not participate in the base year survey with the result that nearly all of these provided names and addresses for random samples of 18 of their class of 1972 seniors. This addition of "resurvey" schools boosted the total size "to close to the targeted 1,200 schools and over 21,000 individuals" (Fetters, 1974:4). Successive follow-up waves were conducted in 1973, 1974, 1976 and an additional wave will be conducted in 1979.

The respondent information available to trackers varied by successive follow-up. Thus, in 1973 each respondent's full name, birth date, name of high school, 1972 address taken from school records, and social security number were available. In 1974 the available information included the respondent's full name, 1973 address, name and address of parents, name and address of two other people not living at the respondent's home, the name of respondent's employer, the respondent's driver's license number, and the name of the post-secondary educational institution attended where appropriate. In the 1976 follow-up the information available included an update

of all previous information and the full name of the respondent's spouse, if married.

Nearly identical tracing procedures were implemented for each follow-up study consisting of:

1. A newsletter with an enclosed return postcard for address verification mailed to respondent's last known address:

   a. Returned change-of-address cards provided file update information.

   b. Newsletter "address correction requested" instructions provided file update information.

2. A multistage sequence of letters, questionnaires, postcards, and mailgrams was sent to addresses obtained from the newsletter mailings.

For those who did not respond or had changed their address, the following tracking procedures were initiated:

3. Telephone calls to parents, guardians, or other close kin requesting respondent's correct address.

4. Contacts with one or both of the two people listed by the respondent in the first follow-up as people who would always know the respondent's address.

5. Contacts with post secondary school the student attended or planned to attend or, if the respondent planned to work full or part time, contacts with the last known employer.

6. Telephone contacts with neighbors or parents of the respondent (names and telephone numbers secured through the city directory, address-telephone cross-reference directories, chambers of commerce, and public libraries).

7. Contacts with the respondent's high school principal, coordinator, teacher or other school official.

8. Telephone calls to the Department of Motor Vehicles.

9. Contacts with local government agencies (e.g., registrars of deeds, election boards) asking them to check their records for the name and address of the individual or his parents.

10. In cases where the respondent is traced to an organization or institution (e.g., prison, armed services, peace corps), a telephone call is placed to the organization or institution.

11. Utilization of local credit bureaus or retail credit companies to obtain a current address.[13]

Detailed records were kept of the procedures followed in tracing each case, some of which is reported in the literature. These procedures resulted in location of over 92 percent of the participants located and responding to each of the three follow-up studies. It appears that the requirements for completing 1,836 cases in the first follow-up tracing effort resulted in the following cost and effort estimates:

Total Tracing Cases (through 12/31/73)	2,835
Total Telephone Calls	12,066
Total Clerical Hours Charged	1,854
Average Toll Calls Per Case	3.43
Average Toll Charges Per Call	$1.71
Average Toll Charges Per Case	$5.88
Average Clerical Hours Per Case	1.01

Conclusion

The seven studies reviewed above provide examples of procedures employed in tracking several kinds of large samples including a city household follow-up, the follow-up of schools in a large metropolitan environment, two state follow-up studies, and three national follow-up efforts. The tracking

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13. A total of 14 referrals to credit bureaus were made in the first follow-up tracing. These yielded no additional information at an average cost of $8.32 per case.

methods employed vary from reliance upon a single technique to some combination of variants of four procedures: telephone contacts, mail-out contacts, field contacts or visits, and record searches. The choice of procedure or combination of procedures varies by the sample size, the geographical distribution of respondents, the project budget and available resources. Studies relying upon any single procedure tended to produce relocation rates of about 60 percent which tends to reflect the stability of families over time. Studies employing some combination of procedures and greater persistence demonstrate relocation rates of 85 to 95 percent and higher. Minimal information is available on the cost of tracking respondents over time, but the costs appear to vary by sample size, geographical distribution of respondents, respondent mobility associated with time lapse, and by the non-budgetary resources available to the trackers including equipment and non-charge-back services. On balance it is apparent that the success of tracking efforts is associated with the availability of person specific information in the initial study, preparation and execution of the tracking design, the use of multiple tracking procedures, and persistence. In the following section we summarize criteria for assessing the feasibility of conducting a follow-up study based upon our review of the literature. In the concluding section we provide a detailed documentation of the procedures, response rates, and costs incurred in The Career Development Study.

II. CRITERIA FOR ASSESSING THE FEASIBILITY OF CONDUCTING A FOLLOW-UP STUDY[14]

From a methods perspective[15] the difficulties encountered in tracking respondents are largely due to limitations imposed by the Time I research design. Because of such contingencies, not every cross-sectional data set lends itself to extension into a panel design. What follows is a statement of considerations and decisions that ought to be made prior to undertaking the second wave of a panel study. By identifying and addressing these, one may avoid or partially compensate for serious problems that may arise in the course of the follow-up and may later force the researcher to gasp and grasp for belated "fix-up" procedures.

Parnes (1972) identifies three major problems associated with panel studies: attrition, measurement error, and sensitizing respondents by repeated measurement. While the latter two must and can also be dealt with, the present focus is limited to a discussion of the problem of sample attrition over time. Prior to initiating the second wave of a panel research design, decisions must be made which relate to three areas:

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14. Vaughn R.A. Call's assistance in recording and ordering the details reported in the following sections is gratefully acknowledged.

15. Discussion of the theoretical adequacy of initial data bases for extension into panel designs is beyond the scope of this presentation. We assume that such an affirmative judgment has been made--an assumption the researcher cannot make.

1. The extent and accuracy of the available data documentation;
2. The characteristics of the Wave I respondents and their families; and
3. The resources available to the researcher.

Data Documentation

Theoretical considerations aside, one of the most crucial issues in determining the feasibility of a follow-up study is the extent to which the original research design is documented, includes identifying information on the original respondents, and provides data quality check points. Minimally, it is necessary to know:

1. The date of the original study;
2. The population sampled;
3. The sampling frame;
4. The method for selecting the sample (probability versus non-probability);
5. Response rates for the original study;
6. The procedure used to compensate for nonresponse, if any (e.g., substitution);
7. Contingencies that occurred in the course of the original research (e.g., schools dropping out of the original study for political reasons);
8. Publicity or controversy that affected response rates or data quality;
9. The codebook used in coding all variables and constructing all scales;
10. The reliability of the original data (the extent of coding error, measurement error, and nonconformity to such selected population characteristics as education, income, and the like); and
11. The weighting procedures used in creating computer records of the data.

This information permits an assessment of the quality of the Time I data and the adequacy of the data for generalizing to theoretically relevant populations. Of course, the ability to link the names of the original respondents with the correct data cases is a prerequisite to accomplishing a follow-up study.

Usually researchers do not anticipate the need to gather additional relocation information from respondents and, therefore, provide few "anchor points" to assist tracking respondents in the future. We use the term "anchor point" to refer to information about an individual that separates his/her identity from that of all other respondents in the sample. The fewer the anchor points, the more difficult--and, indeed, the more costly--it is to relocate the original respondents. The vital anchor points are these:

1. The full name of the respondent (middle names are often crucial);
2. The respondent's birth date;
3. The names of the respondent's best friends, or the names of two or three close relatives or guardians, or the names of two people whom the respondent has indicated "will always know his/her whereabouts";
4. The father's and mother's full name (mother's maiden name is sometimes useful);
5. The spouse's full name if married;
6. A previous mailing address (respondent's and/or parents'); and
7. The name of the father's employer.

Highly desirable information includes the respondent's social security number and, in the case of high school students, the name and address of their high school.

Temme's (1975) follow-up of the Adolescent Society sample indicates that approximately 50-55 percent of the families of high school students continued to reside at the address reported 12-15 years earlier. Our experience confirms this finding. Moreover, in our sample of State of Washington respondents, 45 percent of the high school students continue to live in the same community 12 years later. In those cases where a respondent's family has moved, most continue to have relatives in the community. Although the parental family network is generally the easiest to locate and the least expensive source of information concerning the respondent, few studies include questions which facilitate subsequent tracking through the parental family. If future follow-ups are contemplated[16] and anonymity is not essential, consideration should be given to including a basic tracking fact sheet at the time of collecting Time I data and to creating a confidential information file to facilitate subsequent long-term follow-up studies.

Respondent and Family Characteristics

Having established the feasibility of conducting a follow-up study, several additional considerations bear upon the expected degree of difficulty and costs of conducting the tracking effort. Characteristics of the original sample may place additional constraints on the procedures that may be used in tracking individuals.

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16. Even if a follow-up is not anticipated at the time of data gathering, later research needs may warrant the follow-up of a previous cross-sectional study. Such follow-ups can be accomplished at a considerable saving if a minimal amount of basic tracking information is available.

In the past it was assumed that the geographic dispersion of target populations was inversely associated with response rates. Campbell and Katona (1953:29), for example, categorically allow for a 25 percent loss of cases in national panel studies. Fortunately, the methodology of tracking panel respondents has progressed over the past quarter century such that many multi-state and national studies report relocation rates above 80 percent and many regionally restricted studies report rates above 90 percent of the original respondent coverage (e.g., Crider, Willits and Bealer, 1973:7; and Eckland, 1968:53). Clearly, national and multi-state panel studies may require a larger, more elaborate, and more costly tracking organization; but this does not necessarily mean that regional tracking offices and managers are required.

The urban-rural composition of a population is known to affect tracking effectiveness (Crider and Willits, 1973:59; Barnes, 1972:151). Respondents from rural areas are easier to find due to better informed social networks that usually know the whereabouts of most families. While social networks are usually not as strong in urban areas, neighbors and friends may provide useful leads for locating mobile families. City directories may be usefully employed for locating respondents in larger metropolitan areas.

Families living in cities usually have addresses that include house numbers which provide for precise location. Rural routes and rural post office boxes are less accurate and helpful in pinpointing the previous location of a family, but the lack of a precise address does not mean that the postal service cannot or will not deliver mail in small communities. In our experience letters mailed to 12-year-old addresses resulted in 49 percent

marked "undeliverable" and returned in cities over 10,000 population; 35 percent marked and returned in cities with populations between 1,000 and 10,000; and only 21 percent marked undeliverable and returned in towns with population of less than 1,000. While these figures may represent differential mobility by community size, we found that movement to a new address in a large city (even if the individual relocated only a few blocks away) is likely to result in undeliverable mail. Under current postal operations, letters mailed to families in rural areas will usually be forwarded to the proper individuals. The rural carrier's personal knowledge of families he has serviced over the years undoubtedly accounts for the greater success in forwarding mail in rural America; and recent efforts by the postal service to close rural stations could dramatically affect mail forwarding practices in rural areas.

The literature documents the difficulties of tracking minority samples. Bright (1967), for example, reports that blacks are more difficult to track than are whites. Wilcox (1965) reports that minorities, especially the foreign-born, are more likely to have had name changes. Glasser and Metzger (1975) report that nonwhites are more likely to have unlisted telephone numbers than their white counterparts.

Several additional characteristics of individuals and families may affect the success of tracking efforts. For example, families are known to withhold information about family members in prison or in trouble with the law (Homans, 1972). Neighborhoods undergoing rapid change often lack reliable informal sources of information on individuals and families (Willits, et al., 1969). Families broken by divorce or death are harder to locate

(Bright, 1967). Individuals who do not participate in formal organizations are more difficult to locate than are participants (Crider and Willits, 1973). Age of respondents may become a factor inasmuch as 18-34 year olds have more unlisted telephone numbers than those older (Glasser and Metzger, 1975). While gender differences have not been found in relocation studies (Bright, 1967; Willits, et al., 1969), single women have more unlisted telephone numbers and name changes that may increase tracking difficulties. This is particularly true if the family has been broken by divorce. Finally, individuals in the military may be difficult to locate because of their high mobility and lack of social contacts in stable communities. Military locator services may be useful but generally require the social security number or military identification number of the respondent, which is often not available.

Special populations may require adjustments in tracking procedures. Relocation of disabled individuals or their families is generally thought to require greater use of public and medical records. For example, it is argued that the help of medical and welfare personnel with access to confidential records may be one of the few ways--and, perhaps, a very quick way--to locate disabled individuals who continue to receive treatment or assistance (Bockoven and Soloman, 1975). However, Freeman and Simmons (1960:410) argue that "...the social scientist has oversold himself about the special nature of mental illness research and the inapplicability of much of his methodology." Willits, et al (1969) conclude that typical public record searches are not an effective tracking method, unless one has enlisted the cooperation of social service officials and medical personnel. Bright (1967) reports high relocation rates in tracking the chronically ill

using a combination of various types of tracking procedures. Sudman (1966) reports that telephone screening techniques resulted in higher cooperation and less cost for studying the visually impaired. The point is that special populations, including those beyond the public view, can also be relocated with appropriate adjustments to the tracking methods. In dealing with these kinds of populations, a reasonable judgment must be made about balancing the need for successful tracking procedures against the physical impositions and privacy needs of the individual. In summary, the diversity of individual characteristics in a sample bears directly on the number and type of tracking procedures that must be employed.

A final consideration involves the time interval since the last contact was established with the individual or his/her family. As one might assume, the longer the time lapse, the greater the difficulty and the more the expense in tracking and positively relocating individuals who participated in an earlier study. Clearly, the opportunities for mobility out of the neighborhood, community, county, state, even nation, increase as time elapses. It should be noted, however, that tracking difficulty and expense are not necessarily a linear function of time lapse. As we will explain below, high school 10 and 20 year class reunions are commonplace particularly in larger high schools; and we have been amazed at the thoroughness and success that many high school class reunion committees have demonstrated in tracking their classmates. We have used high school class reunion lists and addresses to tremendous advantage, as did Temme (1975). All other considerations aside, it is much easier to locate respondents following 10 and 20 year class reunions than after other time intervals, where difficulty and expense increase as the time interval lengthens.

Finally, it should also be noted that time lapse since the previous contact with respondents interacts with the tracking procedure employed. Thus, Willits and colleagues (1969:72-74) report that in 1969 tracking procedures through the respondents' 1947 community of residence were more effective than procedures through the respondents' 1957 community of residence. The researchers explain that efforts to locate through the earlier residence focused on parental families which were more stable than efforts to track through latter residences, which focused on families of procreation.

Resources

Three forms of resources must be available to the panel tracking researcher: personnel, facilities, and budgets. To the extent these are constrained, the effort may be compromised. Tracking reports routinely note the importance of well-trained personnel. Several personality traits are especially useful:

1. Interpersonal skills;
2. Reliability;
3. Inquisitiveness and creativity;
4. Persistence coupled with patience; and
5. Attention to detail in finding "leads" and logging details of the search.

In addition, several acquired capabilities are important:

1. General knowledge of the study;
2. Experience in the several aspects of the tracking enterprise; and
3. Commitment to the success of the study.

Once begun it is useful (and worth the money) for several trackers to jointly review hard-to-find cases and to exchange information on procedures and experiences. Also, we have found that assigning "unlocatable" cases to new personnel often results in fresh insights and the development of a new track which eventually leads to the hard-to-find respondent. Tracking the hard-to-locate is frequently more of an art than a science requiring some combination of interpersonal skill, persistence, intuition, resourcefulness, and luck. The desired personal qualities for effective tracking are best expressed by Barnes (1972:147): "...we like our interviewers to have St. Bernard instincts as well as Bulldog tenacity."

An occupational hazard in the relocation enterprise is tracking fatigue. Clarridge, et al. (1978) found it necessary to limit telephone tracking to two-hour periods in an effort to maintain tracker efficiency. We find that trackers can work efficiently up to three and even four hours at one time provided that their activities are varied, there is an opportunity to physically move from their phoning stations to accomplish such related tasks as directory searches, and the trackers are not required to work every day.

The facilities available for conducting the tracking effort are a major determinant of the procedures, time, and costs that will be expended. If the tracking effort involves locating a large number of respondents in a normal population, then multiple tracking procedures pursued concurrently may be advisable. Facilities may be needed to generate multi-stage mass mailings, to conduct extensive telephoning, to search for leads through

telephone and city directories and records materials, and to log and file reports.

Mass mailing technology has progressed significantly in recent years. Indeed, the "Dear Occupant" or "Dear Participant" on computer printed labels can no longer be considered a serious effort at tracking respondents. Dillman and Frey (1974) and Carpenter (1974) report that personalization is the key factor in obtaining high response rates. They also provide evidence that multiple mailings have a positive effect on eventual returns (Dillman, 1972). Thus, to optimize mail-out techniques, facilities are needed for generating multiple waves of personalized mail. This requires one of the following: a large secretarial pool; a letter-quality printer linked to a computer; computer-supported word processing equipment; or ink-jet document printers or comparable equipment. With short-time intervals between mailings (7 to 14 days), materials may be generated as needed or may be mass produced in advance and then sorted, depending in part upon the availability of resources. We note that an increasing number of private firms perform personalized mass mailings and the researcher should not ignore the possibility of subcontracting this work with qualified outside vendors.

An adequate search facility requires provision of telephone and city directories. Large national or multi-state studies pose special problems of access to the necessary materials for conducting a search from a centralized location. Thus, for example, university libraries and large city libraries may have extensive holdings of city directories in their reference collections, but libraries typically lend reference materials for

only short periods of time, if at all, and the collections are often incomplete or regionally restricted. An alternative to a centralized tracking location is to travel to communities for personal searches in neighborhoods, but this approach is usually prohibitively expensive. While the price of city directories is high ($50 and more per book), the cost of travel and personnel time is usually considerably greater.

Telephone directories may be purchased at nominal cost when the panel study involves a restricted number of states or areas within a state. Out-of-state searches may be conducted using directory assistance, purchasing selected telephone directories, some combination of the two, or by purchasing a set of microfiched telephone directories. The latter is available commercially on a subscription basis ranging from coverage of the top ten metropolitan areas in the U.S. ($130) to coverage of all areas of 25,000-or-more population centers in the U.S. ($1370). Added advantages of using microfiche telephone directories include their immediate availability, regular updates, ease of use, and minimal storage demands. Success in tracking hard-to-locate individuals may be increased and costs decreased with easy access to city and telephone directories.

If community visits are not required, a centralized tracking room properly equipped and provided with telephone and city directories is an ideal working arrangement. We have found that a telephone survey laboratory with 12 to 15 stations is quite adequate for tracking 7,000 persons over a 6-month period. Access to Wide Area Telecommunications Service (WATS) may lower costs if the service is already available; but it is not necessarily cost effective to have WATS lines installed for tracking purposes. By

telephoning during evening hours and Saturdays when most people are home, considerable savings can be realized by dialing direct as compared with installation and use of the WATS lines.

Keeping current and accurate records is an important component of the tracking endeavor. For most large surveys, computerization of record keeping functions is a practical necessity. Computerization permits the daily updating of progress reports, quick logging of the day's "finds," efficient updating of individual files, and printouts of individuals already located or yet to be found. While it is possible to keep records manually, computerization is likely to be much more efficient and cost effective for large scale projects.

Difficulties arise in budgeting for tracking efforts not only because of the limited records of past experience, but also because of the relatively few fixed costs involved. Previous studies indicate considerable variation in costs. Consider, for example, the costs incurred in a study of relocating 125 children (111 of whom were adopted) after an interval of 16 to 21 years (Skeels and Skodak, 1965). The study was 100 percent successful in relocating participants. The investigators personally visited 208 different communities in 24 states, repeating visits as necessary to several larger communities. In terms of time the investigators spent a total of 309 work days on 55 separate trips totalling travel and per diem expense of $12,583. The estimated salary cost based on percentage of time spent in the field was an additional $18,150. Related expenses are not reported. The total cost of $30,733 averages to $245.86 per child (mid '60s economy) which, the researchers note, was considerably lower than the original

estimates totalling $50,000 to $75,000 for the entire project or $400 to $600 per child. Moreover, these researchers conclude in part: "Results of the investigation indicated that with the use of proper logistics and sound planning, such studies are not only possible, but they are economically feasible and they can provide rich sources of information." We agree with the conclusion; but, as will become apparent to the reader, these reported costs may be quite excessive given the maturing state-of-the-art of respondent tracking.

In estimating tracking costs, a reasonable rule of thumb for former student populations is that approximately 55 percent of the families will still be in the same location after 13-15 years and that roughly 70 percent of the former students will still reside somewhere in the same state after the same period of time. Our experience matches that of Clarridge, et al. (1978) in these details. Our experience further suggests that class reunion lists may enhance relocations by 15 percent over contacts made through parents alone. Finally, potentially 65-70 percent of the respondents can be relocated with state-of-the-art mail techniques. Using these percentages together with local costs for materials and telephoning, a rough estimate of potential tracking costs can be made.

Time for tracking needs to be budgeted liberally inasmuch as a substantial amount of time is needed to accomplish the various tasks associated with reestablishing contact with most former respondents in large panel studies. The Wisconsin study (N = 9,007) took approximately a year and a half to relocate the former students. The Career Development Study required 6 months to relocate 90 percent of 6,805 individuals employing multiple

tracking techniques. Both finances and time are major budgetary considerations that may vary considerably depending upon the characteristics of the sample and the tracking design of the study.

In the following section we provide a detailed account of the procedures employed, the relocation rates achieved, and the costs sustained in tracking participants in The Career Development Study.

III. THE CAREER DEVELOPMENT STUDY

We are interested in empirically establishing the determinants of career lines. The problem requires the use of a panel design. A wealthy data set was located providing substantial base-line information relevant to the questions we are pursuing. Plans were formulated to conduct a follow-up study of a probability sample (N = 6,805) of 1966 high school junior and senior students from the State of Washington.

The 1966 data set is exceptionally well documented. The source documents include:

1. A detailed chronology of proceedings, file memoranda and project minutes;
2. All correspondence including copies of letters sent to participating high schools;
3. Records of sample selection procedures and response rates;
4. Study instruments;
5. Detailed codebooks;
6. Marginal frequencies for responses to all questionnaire items; and
7. The investigators' recollections concerning various aspects of the data gathering process.

In addition, several additional pieces of information were available to us including the name and address cards of each student involved in the 1966 study, interview schedules that included the names and addresses of one-third of the parents of the respondents, and the names and mailing lists for a limited follow-up study of the same sample that was executed in 1971. The original interview schedules and some of the original questionnaires were on file.[17] The principal investigator of the original project was deceased, but we retained the consulting services of his project director which provided an additional source of useful information. Evaluation of the data demonstrated that the coding and key punching were accomplished reliably.

Having obtained access to the data, we faced three major problems related to the feasibility of relocating the respondents. First, the names and addresses of respondents were available, but their parents' names and addresses were not. Whether one considered this to be a primary or secondary liability, the importance of lacking this information could not be underestimated. Willits and colleagues (1969:72-74) had demonstrated that follow-up studies designed to focus on respondents' parents were more successful than those designed to focus on the respondent and his family of procreation. Similarly, Sewell and his colleagues (Clarridge et al., 1976) had already established a new standard of tracking respondents through their parents. Second, we had a limited time frame within which to recontact the respondents. Third, although the principal investigator retained his professorial rank in the State of Washington, the research team was no

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17. Unfortunately, after coding and key punching, most of the questionnaires had been abandoned.

longer located in the state, which posed potential problems of legitimizing the study. Given access to state-of-the-art mass mailing equipment and a well-equipped telephone survey lab, arrangements were made to conduct the study from our location at the Youth Development Center in Omaha, Nebraska, with the cooperation of the Social Research Center at Washington State University. The latter decision not only eased the logistics of the long-range tracking endeavor, but also provided a regional identification and instant legitimacy for the tracking effort. We decided to modify the best available questionnaire methodology (Dillman and Frey, 1974) and to apply it to our tracking efforts. Further, we decided to employ mass mailing procedures prior to use of the telephone tracking procedures. Our objectives were to minimize contacts with the original respondents by focusing our tracking efforts on families rather than respondents and to accomplish a recontact rate of at least 90 percent of the original respondents within 6 months.

Tracking Procedures

The overall tracking design was as follows:

1. A detailed letter explaining the background purposes, timetable, and auspices of the study was sent to the State Superintendent of Schools, School District Superintendents, and Principals of the high schools which were associated with the study in 1965(see Appendix). The primary purpose of the letter was to inform the present school personnel concerning the study so that they would be informed (and supportive) if individuals made contact with the school inquiring about the legitimacy of the study.

2. Mail Tracking (Parents): A four-wave sequence of letters--each containing a cover letter, a return card, and a self-addressed and stamped return envelope--was sent to the 1966 addresses of the respondents' parents. Since we did not have parent's names, the letters were addressed to the last name of the student prefaced by the appropriate salutation for his/her parents (Mr. and Mrs., Mr., or Mrs.) based upon the reported marital status of the parent when the student was first interviewed. The address also included the full name of the former student. Thus, an example of the full address is "Mr. and Mrs. Moore or James E. Moore." The "or" provided the postal service with additional information with which to deliver the mail to the proper family. The intent of the letter was to request a current address for the respondent. Details of the content of the letter and of the enclosed return information card appear in the examples in the Appendix.

3. Mail Tracking (Respondents): In cases where parents did not respond to the four-wave sequence of letters or letters were returned by the postal service marked "undeliverable," a three-wave sequence of letters was mailed to the respondents themselves using their married names and the addresses obtained from 1976 and 1977 class reunion lists.

4. Telephone Tracking: If the respondent could not be located by either the letter sequence addressed to parents or that addressed to the respondent, then telephone tracking procedures were designed to be initiated sequentially as follows:

   a. A search was conducted of telephone and city directories to locate parents and respondents.

b. Class reunion committee members were contacted for help in relocating classmates.

c. Former neighbors, friends, and relatives were telephoned in search of additional information.

d. High schools were contacted requesting information on former students.

e. Former employers of parents were contacted (as identified by 1966 directories).

f. Ads were published in community newspapers requesting public assistance in locating the hard-to-find.

g. Public records and other official files were searched by telephone and letter request.

These procedures are not new (Clarridge, et al., 1978; Carrel, et al., 1975), but represent a multi-method approach and an upgrading of the quality of letters posted so that all "bulk" mail appearances were eliminated. All letters, return cards and envelopes were printed using ink-jet document printers which provided complete personalization of all correspondence. The personalization included respondent's name, address, sex (as indicated by pronouns), year in school and previous participation in the interview sample where appropriate. All envelopes were similarly personalized. All letters were signed manually. And commemorative stamps, which are reported to favorably affect the recipient's likelihood of opening and reading the correspondence (Hensley, 1974), were used on all outgoing mail. A stamped, self-addressed return envelope was provided.[18]

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18. Only the first mailout included the stamped envelope. Where mail was returned as undeliverable we retrieved the unused return envelopes and reused them in the first mailout to the class reunion list addresses. Subsequent mailouts used a business reply format.

A pilot test of the procedures was conducted during the summer of 1977. A stratified random sample (N = 100) of the 1966 respondents was selected. After locating 75 percent by mail techniques, telephone procedures were introduced. The combined efforts proved successful in relocating 100 percent of the respondents in the feasibility subsample. We established direct contact with 98 percent (1 individual is institutionalized and was non-communicative; the second had taken non-established residence in New Zealand). The pilot study satisfactorily demonstrated the effectiveness of our tracking procedures, suggested minor adjustments, and supported the feasibility of proceeding with the full-scale 12-year follow-up.

Having established the tracking procedures to be employed, telephone and city directories were obtained and record-keeping procedures were developed. Both the tracking and record-keeping functions were computer-based.

The personalized letters were produced using IBM 46/40 ink-jet document printers. Record keeping and report generation was accomplished with a Digital Equipment Corporation PDP-11/70 mini-computer using a time-sharing operating system. Special software substantially eased the latter tasks.[19] A master response status file was created at the beginning of the project and has been updated daily with current results of the tracking effort. Using the updated master file, computer programs were written to provide information sheets on each respondent in the study, current summaries of

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19. David A. Chapin's software capability and creativity is gratefully acknowledged.

the tracking results to date, and various coded lists of unlocated respondents.

Timetable

In January, 1978, the mail sequence was initiated for the total sample (N = 6805). Table 1 (next page) outlines the dates and the number of letters sent out for each mailing wave to parents and respondents. All return mail was addressed to the Social Research Center at Washington State University. Approximately 45 percent of the Wave I letters were returned marked "undeliverable" by the postal service. Upon their return, one part-time research assistant pulled a small set of pre-punched computer cards (ID number and name) for each letter returned by the parent, respondent, or postal service from a master file, separated the cards by the appropriate completion code, and forwarded the appropriate computer card to us. This procedure enabled us to maintain current records with daily updates of returns (with a two-day lag due to mailing time). Later, the returned address cards were also forwarded. It is interesting to note that in a few cases the post office was able to forward Wave II letters to the family or the respondent when the Wave I letter was marked "undeliverable" and returned.

By February 24, 1978, responses were received from 3,086 parents from a total of 3,635 letters that were delivered. This constituted an 85 percent response by parents rate prior to our mailing letters to the respondents at reunion addresses and mailing the Wave IV certified letterto nonresponding parents. By the time of initiation of the telephone procedures, 4,249 parents or respondents had returned a current address (63 percent of all

Table 1. Record of Mailing Dates, Types of Letter, and Number of Letters Posted

Date	Letter Type	Number Posted
January 10, 1978	Parental Wave 1[a]	6726
January 18, 1978	Parental Wave 2[b]	6726
February 8, 1978	Parental Wave 3	1813
February 22, 1978	Reunion Wave 5[c]	2242
March 3, 1978	Reunion Wave 6[d]	2242
March 10, 1978	Parental Wave 4[e]	442
March 22, 1978	Reunion Wave 7	552
March 27, 1978	Reunion Wave 5[f]	162
	Total letters sent =	20,905

[a]Personalized letter sent to parents

[b]Reminder letter sent to all parents

[c]Personalized letter sent to 1976/1977 addresses to respondents using high school reunion booklets

[d]Reminder letter sent to all Wave 5 recipients

[e]A certified letter sent to parents

[f]A special mailing to respondents from two high school areas for which we had difficulty obtaining reunion booklets

former respondents). Mail responses continued to arrive after the telephone procedures were initiated such that about 70 percent of the respondents or their families eventually returned an updated address. Figure 1 (next page) illustrates the percent of respondents located by date.

On April 1, 1978, the telephone follow-up procedures were initiated.[20] Four days were spent training nine part-time employees in the art of telephone tracking. The telephone procedures would eventually increase our successful relocations by an additional 25 percent. By July 20, 95 percent of the original respondents had been relocated and the number of part-time employees was substantially reduced. The projected date for obtaining 90 percent of all original respondents was achieved. At the present time, two trackers are continuing the sequential telephone procedures and are now beginning to contact the former employers of parents. Two hundred and fifty-one respondents (3.6 percent) remain to be located.

Several caveats need to be observed. As noted above, one small school did not return the name and address cards which were a part of the original study. Another small school (N = 156) which served Ft. Lewis Army personnel had been consolidated with surrounding schools. We made a personal visitation to each site enlisting the cooperation of the current principal and guidance counselor in the first case, and that of the district superintendent of schools in the second case. Through the diligent tracking

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20. Telephone procedures were initiated during the mailout procedures, which saved us a considerable amount of time. Until the response to the mailout procedures was reasonably complete, we telephoned only those individuals where letters to parents were undeliverable and for whom we had no reunion address.

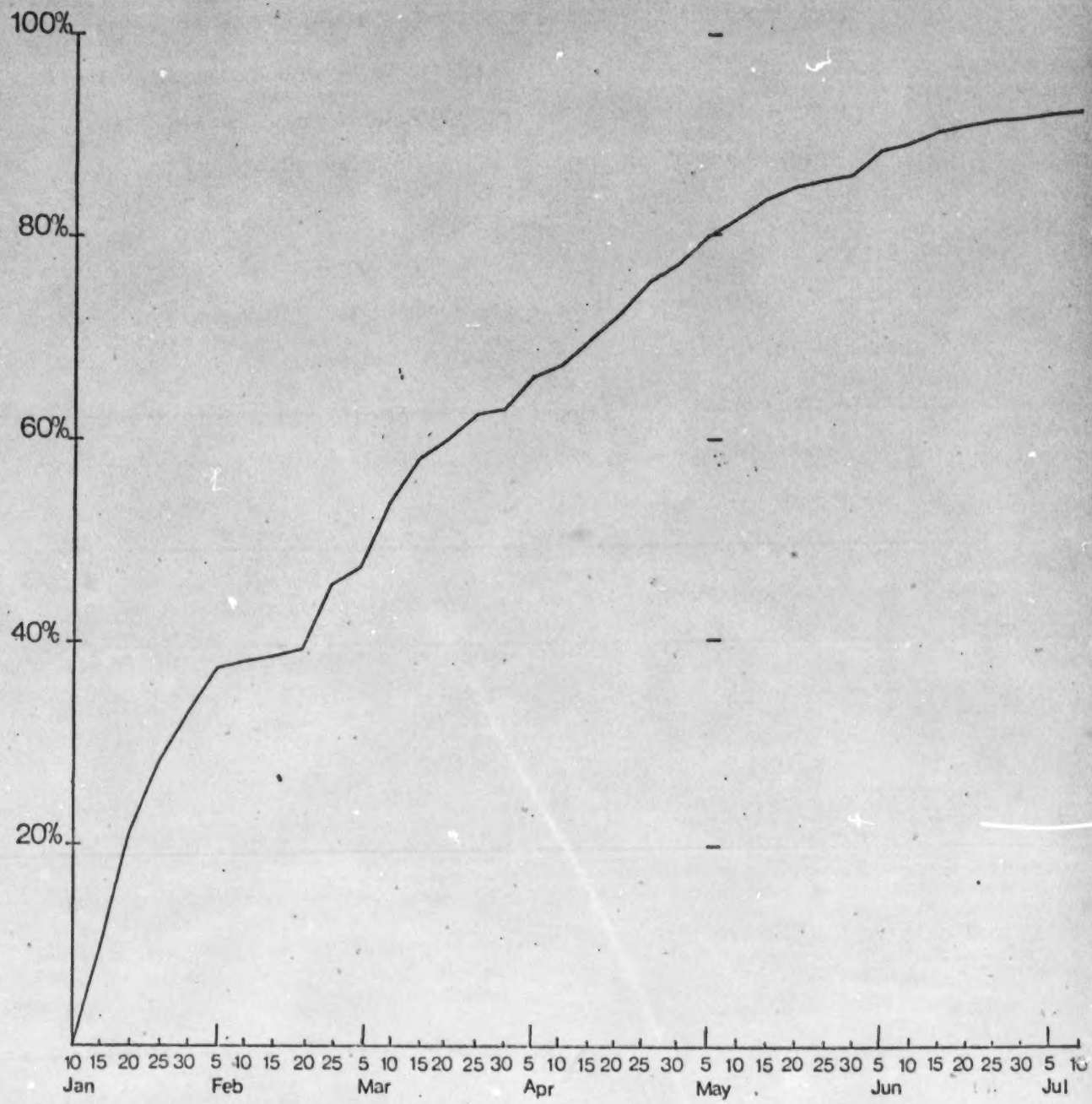

Figure 1: Percentage of original respondents for whom current addresses have been obtained by date.

efforts of one staff member, 91 percent of the respondents in the former school were relocated as were 75 percent of the latter. All of the other 27 schools in the sample have relocation rates of 95 percent or higher. Our present relocation level is 96.4 percent of the original respondents.

Our experience indicates that the multiple wave mailings did encourage parents to respond. Interestingly, parents demonstrated a tendency to return the Wave I reply card even after they had received subsequent mailings. Similarly, certified letters (return receipt requested) enabled the identification of numerous letters delivered to the wrong family or individual. Until they were asked to sign for a letter, current residents at the 1966 addresses of our respondents would often discard letters rather than notify the postal service that the family we were seeking no longer lived at the address. In a few cases in rural areas, the local postal service held our letters thinking that a new family would arrive. The certified letter exposed those tracking failures as well.

In summary, from previous research we have abstracted and implemented multiple methods for tracking panel respondents by which we have achieved highly successful relocation rates. In the following section we demonstrate that the methods are also cost effective.

Tracking Costs

The expenditures we have incurred in relocating participants in The Career Development Study are summarized in Table 2 (next page). For ease in following the presentation the expenditures are presented in terms of major categories associated with the tracking effort rather than in formal cost

TABLE 2. Summary of Tracking Expenditures

	Mail Related	Telephone Related	Total
POSTAGE (stamps, international reply coupons, return postage charges)	$ 4878.97	$ 0	$ 4878.97
MATERIALS (office supplies, stationery, envelopes, printed record forms)	3011.30	365.81	3377.11
LETTER PREPARATION (printing of 2 sets of 4 wave personalized correspondence)	5558.26	0	5558.26
TELEPHONE LAB CHARGES (charges for 12 telephone hook-ups and monthly charges)	0	1260.00	1260.00
TELEPHONE CHARGES (primarily direct dial evening and Saturday rates)	0	5624.48	5624.48
STAFF SALARIES AND BENEFITS (fractional time for project director, secretary and research assistant)	9999.12	6573.36	16572.48
PERSONNEL (part-time for clerical tasks, class reunion committee assistance)	2447.77	0	2447.77
TELEPHONE TRACKERS (part-time)	0	7133.00	7133.00
SEARCH MATERIALS (phone fiche, telephone and city directories)	0	3109.96	3109.96
COMPUTING CHARGES (programmer for software development, billings)	2600.00	1655.00	4255.00
WASHINGTON STATE UNIVERSITY, SOCIAL RESEARCH CENTER CHARGES (computing, indirect cost, miscellaneous)	430.48	0	430.48
TRAVEL AND PER DIEM (field visit to two schools)	0	715.56	715.56
TOTALS	28,925.90	26,437.17	55,363.07

Table 2. continued:

Per Case Costs:

Total N = 6805
Located to date:

Mail Procedures	N = 4702	
Telephone Procedures	N = 1828	
Total	N = 6530	(96%)

Per Case Costs:

Average Cost per Location:

Mail	$ 6.15
Telephone	14.46
Total	$ 8.48

Adjusted Per Case Costs
(Institutional Indirect Cost Rate of 35% of Total Costs)

Mail Procedure	$28,925.90	$39,049.97
Telephone Procedure	26,437.17	35,690.18
Total	$55,363.07	$74,740.14

Average Adjusted Cost per Location:

Mail	$ 8.30
Telephone	19.52
Total	$11.45

accounting categories. The expenditures are allocated between the major methods we used, namely mail and telephone procedures. They are averaged across respondents located. Finally, they are totalled and adjusted to include an institutional indirect cost rate of 35 percent of total costs.

We emphasize the following points regarding these figures. First, wherever possible the figures correspond to actual expenditures for which receipts and time and effort statements exist. They are not blue-sky estimates. Second, by intention the figures represent an upper statement of costs. They are liberal estimates in several respects: a) where supplies were ordered, the total costs are reported, including unused materials earmarked for data collection procedures; b) where in-house charge-back procedures do not exist--e.g., computing costs, software development, acquisition of library materials including tracking resources--we have calculated the costs on the basis of standard rates charged elsewhere; and c) we have adjusted the costs to include an indirect cost rate which does not in fact apply to our own situation. In summary, where we have had the advantages of services and resources that are not charged, we have included estimates of what those costs might be under full cost accounting circumstances.

Figuring the upper limit of expenditures, our records indicate an average per case relocation cost of $11.45 per respondent. We caution against direct comparisons with earlier studies which may have had the advantage of lower wage scales, postage, telephone and service rates. We further caution against generalizing these costs to other research settings which may have their own unique configuration of resources that may be used to advantage, and to other samples whose unique features must be taken into

account in developing an effective and efficient tracking design. Nonetheless, we submit that even at the current cost of living index successful relocation of respondents in long-term and large-scale panel studies can be justified as cost effective.

SUMMARY AND CONCLUSIONS

This paper addresses three issues associated with the uncertainty regarding the value of long-term and large-scale panel studies: a lack of established tracking procedures, the problem of sample attrition, and the question of the economic feasibility of relocating study participants. We have presented a summary statement of the state-of-the-art in tracking methods and have presented a detailed outline of the procedures, response rates, and costs incurred in a recent project of our own design and execution.

A review of the tracking procedures employed in previous studies reveals considerable variation in the kinds of samples followed, the tracking methods employed, and the results obtained as measured by relocation rates and associated costs. The representative studies we reviewed included samples consisting of a city household follow-up, schools in a large metropolitan environment, state follow-up efforts, and examples of national follow-up efforts. The methods used consisted of telephone tracking procedures, mail-out procedures, field contacts or visits, and record searches--or some combination of the four. In reviewing the previously completed studies, we observed that the success of the relocation efforts

appeared to be closely associated with the availability of the person-specific information on the original respondents, thorough preparation and careful execution of the tracking design, the use of multiple tracking procedures, and persistence.

From the literature we abstracted a number of considerations and decision points that might inform consideration of the feasibility of attempting to relocate participants in other studies. The decisions relate to three areas: the extent and accuracy of the available data documentation, the characteristics of the Wave I respondents and their families, and the resources available to the researcher.

We outlined our experience with the twelve year follow-up of former high school students in The Career Development Study as a way of illustrating the application of the principles we abstracted from earlier efforts. We employed multiple search and tracking strategies in a design based on a combination of mail-out and telephone contact procedures. We overcame the difficulties associated with being physically removed from our sample concentration by establishing a working relationship with a local state university. We used automated technologies wherever possible including the personalization of mass mailings, maintaining respondent status records, and accomplishing directory searches. We committed professional staff and employed part-time personnel to accomplish the various tasks, notably that of conducting the telephone search. We maintained detailed records of time, effort and expenditures. Over a 9 month period we produced a 96.4 percent relocation rate at an average cost of $11.45 per case.

There are several issues we have not addressed: the issue of a potential methods bias in tracking procedures, issues relating to the effect of tracking strategies on survey response rates, the challenge of tailoring follow-up designs to meet specific objectives or to deal with special samples. These and other important issues require further consideration.

In summary, from previous research we have abstracted and implemented multiple methods for tracking panel respondents which we have demonstrated to be highly successful in terms of cost effectiveness and relocation rates. We invite further refinement and documentation of the methods.

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APPENDICES

Example - Wave One Letter

Example - Wave Two Letter

Example - Wave Three Letter

Example - Wave Four Letter

Example - Return Card Enclosure

WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON 99164

CAREER DEVELOPMENT STUDY
SOCIAL RESEARCH CENTER

EXAMPLE - WAVE ONE LETTER

January 9, 1978

Mr. and Mrs. Call
4130 South Cook Street
Spokane WA 99203

Dear Mr. and Mrs. Call:

In 1966 your son, Vaughn, took part in a statewide study of the educational and occupational plans of Washington high school students. At that time more than 7000 students reported how much more education they hoped to receive and what occupations they wanted to pursue. Each provided an address where we might be able to locate them in later years. Vaughn listed your name and address.

More than 10 years have passed and we are now studying whether those same youth have met their educational and occupational goals. Similar studies have been completed in the eastern states, but as yet little is known about the career problems experienced by youth who attended Washington and western high schools. This scientific study will help to answer some of the questions and problems which deeply concern many parents who are trying to help their sons and daughters prepare for the future.

We ask for your help in continuing the important research in which Vaughn took part while in high school. Young people tend to move around quite a bit and we need to reach all of the students who participated in the original study. Therefore, we are contacting you and the parents of your son's classmates in order to locate the young men and women who participated in the study.

Enclosed is a card with Vaughn's name and your name and address. Please fill in Vaughn's current address and any change in name so that we may write to him to explain the continuing study. The information will remain confidential.

If you have any questions please contact: Dr. James F. Short, Jr., Social Research Center, Washington State University.

Thank you for your help.

Sincerely,

Luther B. Otto

LUTHER B. OTTO, Ph.D.
Project Director

WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON 99164

CAREER DEVELOPMENT STUDY
SOCIAL RESEARCH CENTER

EXAMPLE - WAVE TWO LETTER

January 18, 1978

Mr. and Mrs. Call
4130 South Cook Street
Spokane WA 99203

Dear Mr. and Mrs. Call:

Last week we wrote to you and asked for Vaughn's forwarding address so that he could take part in the continuing study of Washington youth.

If you have already returned the card, we greatly appreciate your prompt assistance. If you have not returned it, simply complete the enclosed card by providing Vaughn's current address and any name change. Please mail it today.

It is very important that we reach all of the individuals who were part of this scientific study when they were younger.

Thank you very much.

Sincerely,

Luther B. Otto

LUTHER B. OTTO, Ph.D.
Project Director

WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON 99164

CAREER DEVELOPMENT STUDY
SOCIAL RESEARCH CENTER

EXAMPLE - WAVE THREE LETTER

February 7, 1978

Mr. and Mrs. Call
4130 South Cook Street
Spokane WA 99203

Dear Mr. and Mrs. Call:

About three weeks ago we wrote to you asking for the forwarding address of your son, Vaughn. We have not yet received a reply.

About 10 years ago, Vaughn was part of a long-term study of Washington youth. We now need to make contact again with him in order to update the information he provided to us while in high school. It is important that we be able to contact your son and we ask for your help in providing his forwarding address and any name change.

Please assist this important research by completing the enclosed form. Note Vaughn's current address and any name change and mail the card immediately. We anxiously await your reply.

Thank you very much for your cooperation.

Cordially,

Luther B. Otto

LUTHER B. OTTO, Ph.D.
Project Director

WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON 99164

CAREER DEVELOPMENT STUDY
SOCIAL RESEARCH CENTER

EXAMPLE - WAVE FOUR LETTER

March 9, 1978

Mr. and Mrs. Call
4130 South Cook Street
Spokane WA 99203

Dear Mr. and Mrs. Call:

Earlier we asked for your help in obtaining a current forwarding address for your son, Vaughn. A reply to our letters has not yet been received.

As you know, parents are very concerned about helping their children choose the career which is right for them. We are greatly encouraged by the assistance that other parents have given us. The success of this study depends heavily upon Vaughn being able to let us know his experiences since high school. He may be able to give us insights that cannot be provided by his high school classmates.

It is important that we contact your son and we are sending this letter by certified mail to insure delivery. Vaughn and his classmates began this study with us when they were in high school. Please complete and return the enclosed card. This will enable us to write to him to explain the continuing study.

Thank you very much for your help.

Sincerely,

Luther B. Otto

LUTHER B. OTTO, Ph.D.
Project Director

Please...

Help make this study a success by filling out this form (both sides) and mailing it TODAY. A pre-addressed, postage-paid envelope is provided for your convenience.

1. What is Vaughn's current name and address? (Please print)

Name_____
(first) (middle) (last)

Street_____

City_____ State_____ Zip_____

Phone number ( )_____

Form No. 123456

Over

2. Please indicate your full name and address on the lines below:

Name_____
(first) (middle) (last)

Street_____

City_____ State_____ Zip_____

Phone number ( )_____

1

THANK YOU FOR YOUR HELP